electrically or electromagnetically operated by energisation or de-energisation of an electromagnetic actuator winding. It will further be appreciated that references to "actuation of a valve" to cause a valve to move between its operating positions may, for an electromagnetically operable valve, be implemented either by increasing the energisation level of the actuator winding or by decreasing the energisation of the winding to cause said movement. Other forms of valve actuation means would, however, be envisaged by those skilled in the art, both hydraulic and/or mechanical, whilst still achieving the required valve functions.

[0172] For any of the embodiments of the invention described previously, typically the system may be operated so as to achieve injection at a first pressure level that is significantly lower than the second pressure level, for example so as to permit a pilot injection of fuel at pressure P1 to be followed by a main injection of fuel at pressure P2 (for example, as shown in **FIG. 10**), or to permit a boot-shaped injection event to be achieved (for example, as shown in **FIG. 11**). For example, the second pressure level that is achieved with the rail control valve **62** closed may be between 5 and 10 times higher than the first pressure level that is achieved when the rail control valve **62** is open.

[0173] One practical embodiment of the fuel system of the present invention, as for any of the embodiments described previously, is shown in **FIG. 19**. For clarity, corresponding features to those shown in FIGS. **7** to **9** are denoted with the same reference numerals. The cam drive arrangement includes a cam follower **124** that rides over the surface of the cam **26** as the cam rotates and is arranged to impart drive to a drive member **126**, for example in the form of a tappet, that is coupled to the plunger **66**. The drive member **126** is driven under the influence of the cam arrangement **68**, **124** to reciprocate within a cylinder **128** and, thus, imparts reciprocating movement to the plunger **66**. A pin **130** is secured to the drive member **126**, and a return spring **132** is mounted upon a shaft **134** of the engine which cooperates with the pin **130** so as to return the drive member **126** and follower mechanism as the follower **124** rides over a falling flank of the cam **68**. The plunger **66** is arranged to be substantially perpendicular to the axis of the injector.

[0174] As can be seen in **FIG. 19**, the diameter of the common rail **59** is smaller than that of the shaft **134**. It is possible to use a common rail **59** of relatively small size, as it need only be charged with fuel at the first, moderate pressure level due to the provision of the pump arrangement **63** and the rail control valve **62** which permit an increased pressure level to be supplied to the injector **14** when the rail control valve **62** is closed. By way of example, the moderate pressure of fuel within the rail may be around 300 bar, compared with pressures around 2000 bar in known common rail systems. As the common rail **59** may be of relatively small size, it is possible to house the rail **59** within another component of the engine.

[0175] In an alternative configuration to that shown in **FIG. 19**, the shaft **134** may be the engine rocker shaft and may be hollow so that the rail may extend through a region of the hollow shaft. As a further alternative the rail may be provided within a region of an engine cylinder head.

[0176] It will be appreciated that the fuel injection system of any of the embodiments described previously may be implemented as in **FIG. 19**.

[0177] Obviously, many modifications and variations of the present invention are possible in light of the above teachings. The invention may be practiced otherwise than as specifically described within the scope of the appended claims.

What is claimed is:

1. A fuel system for use in an internal combustion engine, the fuel system comprising;

a fuel pump having a pumping cycle during which fuel is pressurised to a high level within a pumping chamber for delivery to an injector, whereby the injector is arranged to provide a primary fuel injection event, and a secondary fuel injection event within the same pumping cycle, in use;

the injector including a valve needle which is engageable with a valve needle seating to control fuel delivery and an injection control valve arrangement for controlling movement of the valve needle so as to control the primary and secondary fuel injection events; and,

the fuel system further comprising an accumulator volume for storing high pressure fuel for delivering the secondary fuel injection quantity, and an additional valve arrangement for controlling the supply of fuel stored within the accumulator volume to the injector for the secondary injection event.

2. A fuel system as claimed in claim 1, whereby the primary injection event takes the form of a main fuel injection event, during which a main fuel injection quantity is delivered, and the secondary injection event takes the form of a late post injection event, during which a late post fuel injection quantity is delivered, whereby the late post injection of fuel occurs after the main injection of fuel in the pumping cycle.

3. A fuel system as claimed in claim 2, including an after treatment device.

4. A fuel system as claimed in claim 2, wherein the additional valve arrangement is arranged to deliver a late post fuel injection quantity which is approximately the same as the main fuel injection quantity.

5. A fuel system as claimed in claim 2, wherein the additional valve arrangement is arranged to deliver a late post fuel injection quantity of approximately between 5% and 20% of the main fuel injection quantity.

6. A fuel system as claimed in claim 2, wherein the injection control valve arrangement and the additional valve arrangement are arranged to provide a sequence of between 3 and 5 consecutive main fuel injection events, each of which is accompanied by a late post fuel injection event.

7. A fuel system as claimed in claim 2, wherein the injection control valve arrangement and the additional valve arrangement are arranged to provide a periodic distribution of late post fuel injection events between main fuel injection events.

8. A fuel system as claimed in claim 2, wherein the additional valve arrangement takes the form of an electromagnetically operable valve.

9. A fuel system as claimed in claim 2, wherein the additional valve arrangement takes the form of an hydraulically operable valve.

10. A fuel system as claimed in claim 9, wherein the hydraulically operable valve includes a valve member which is movable between open and closed states in response to a